

Accuracy Characteristics for Final Delivery Scenario Hours 1300-1800 Single Site

1 Introduction

This document contains scenario characteristics for hours 1300 to 1800 GMT recorded on May 26, 1999 at Memphis ARTCC and cover either the ZME or ZID airspace. Characteristics to be provided are general statistics determined from the scenario on airspace characteristics, aircraft to aircraft and aircraft to airspace encounters, general air traffic, aircraft, flight plan adherence, interfacility traffic flow and deviations in weather forecasts. Definitions of the provided scenario characteristics are provided in Reference[1].

2 Reference

[1] Paglione,M., Oaks,R., Ryan,Dr. H., Summerill,J.S., (Final, January 2000), *Description of Accuracy Scenarios for the Acceptance Testing of the User Request Evaluation Tool (URET) / Core Capability Limited Deployment (CCLD)*, FAA William J. Hughes Technical Center / ACT-250, Atlantic City, New Jersey.

NOTE – Section numbers in this document do not map to those of the reference document.

3 Center Airspace

This section corresponds to Section 3.1 of Reference[1]. The below data corresponds to the ZME Center using the May 20, 1999 ACES chart cycle. Information gathered from running URET PRE, accessing the ZME Center Internet site and local knowledge.

Metric	Definitions	Count
Center Area	Approximate Square Miles	120000
Airports	From URET DU Adaptation List	778
Sectors	From URET DU Adaptation List	110
SAA	Special Activities Airspace	57
APDIA	Automated Problem Detection Inhibited Area	20
SID	Standard Instrument Departure	11
STAR	Standard Arrival Route	10
PAR	Preferential Arrival Route	594
PDR	Preferential Departure Route	346
PDAR	Preferential Departure Arrival Route	124

4 Aircraft Encounter Distributions

The statistics collected in this section characterize aircraft to aircraft encounters. The encounter counts are partitioned by selected minimum horizontal separation intervals, a count of encounters partitioned by standard flight levels, and by vertical phase of flight and aircraft encounter angle. This section corresponds to Section 3.2.1 in Reference[1].

4.1 Count Partitioned by Minimum Horizontal Separation

This section corresponds to Section 3.2.1.1 in Reference[1].

Table 1: Count of Current Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	13 Minutes Adherence
$0 \leq d < 5$	144	85
$5 \leq d < 10$	182	98
$10 \leq d < 15$	234	135
$15 \leq d < 23$	495	279
$23 \leq d < 30$	383	228
Total	1438	825

Table 2: Count of Trial Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
$0 \leq d < 5$	144	84
$5 \leq d < 10$	182	95
$10 \leq d < 15$	234	126
$15 \leq d < 24$	543	289
$24 \leq d < 30$	335	193
Total	1438	787

4.2 Count Partitioned by Altitude for Standard Separation Intervals

This section corresponds to Section 3.2.1.2 of Reference[1].

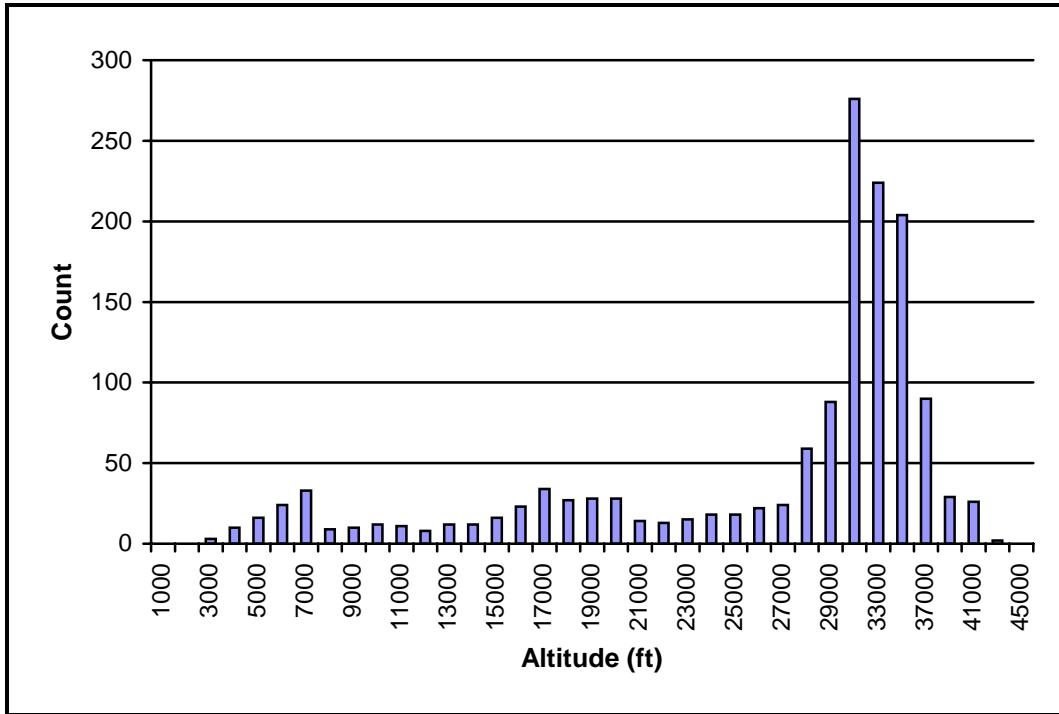


Figure 1: Aircraft to Aircraft Encounters by Altitude

4.3 Count Partitioned by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.1.3 of Reference[1].

Table 3: Count of Aircraft Encounters Partitioned by Phase of Flight and Encounter Angle

Vertical Phase	Encounter Angles (deg)				Total
	[0, 45)	[45, 90)	[90, 135)	[135, 180]	
Cruise-Cruise	125	103	66	34	328
Descend-Descend	36	16	6	7	65
Climb-Climb	33	7	7	7	54
Cruise-Climb	155	84	78	85	402
Cruise-Descend	148	104	87	106	445
Climb-Descend	35	26	18	43	122
Unknown	9	6	4	3	22
Total	541	346	266	285	1438

5 Airspace Encounter Distributions

This section provides statistics on aircraft to airspace encounters. Three areas considered are counts partitioned by selected minimum horizontal separation intervals, an encounter count partitioned by standard flight levels, and a count partitioned by vertical phase of flight and airspace encounter angle. Additionally, vertical phase of flight count is separated into top, bottom and side airspace encounters and for encounters with unknown encounter angles. The section corresponds to Section 3.2.2 of Reference[1].

5.1 Count Partitioned by Minimum Horizontal Separation

The section corresponds to Section 3.2.2.1 of Reference[1].

Table 4: Count of Current Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	13 minutes Adherence
Conflicts ¹	2241	1912
$d = 0^2$	40	33
$0 < d < 7$	864	696
$7 \leq d < 9$	232	183
$9 \leq d < 11$	190	138
$11 \leq d < 16$	536	434
$16 \leq d < 30$	1807	1423
Total	5910	4819

Table 5: Count of Trial Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
Conflicts ³	2241	1874
$d = 0^4$	40	32
$0 < d < 8$	989	779
$8 \leq d < 11$	297	222
$11 \leq d < 13$	190	149
$13 \leq d < 19$	735	581
$19 \leq d < 30$	1418	1081
Total	5910	4718

¹ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

² This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

³ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

⁴ This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

5.2 Count Partitioned by Altitude

This section corresponds to Section 3.2.2.2 of Reference[1].

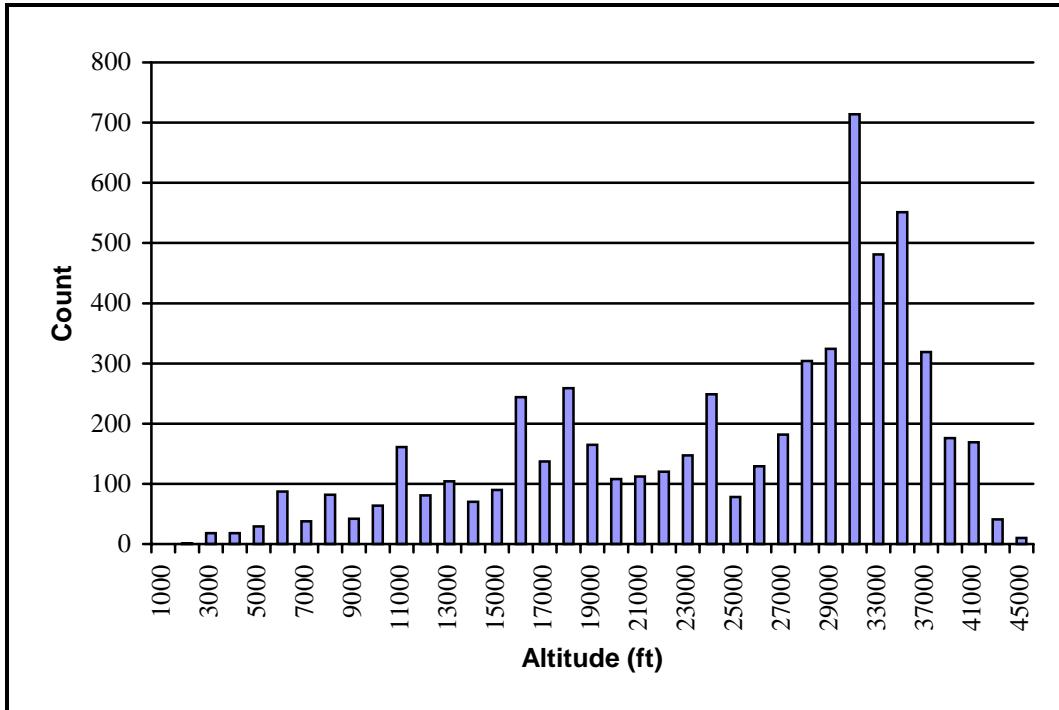


Figure 2: Airspace to Airspace Encounters by Altitude

5.3 Count by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.2.3 in Reference[1].

Table 6: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Side Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	18	63	113	194
Cruise	147	572	738	1457
Descend	15	60	61	136
Total	180	695	912	1787

Table 7: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Top and Bottom Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	156	0	0	156
Cruise	0	0	0	0
Descend	20	0	0	20
Total	176	0	0	176

Table 8: Count of Airspace Encounters by Vertical Phase of Flight with Unknown Angles

Vertical Phase	Count
Climb	60
Cruise	184
Descend	34
Total	278

6 Air Traffic Distributions

This section provides metrics that characterize the air traffic. The metrics are flight density partitioned by standard flight levels, flight type and sector penetration, statistics on the number of active flights, ground speed statistics, counts of interim altitude and amendment messages, and air traffic maneuvers by altitude and phase of flight. This section corresponds to Section 3.3 of Reference[1].

6.1 Air Traffic Density

This section corresponds to section 3.3.1 of Reference[1]. Detailed statistics on aircraft encounters are provided in Appendix A.

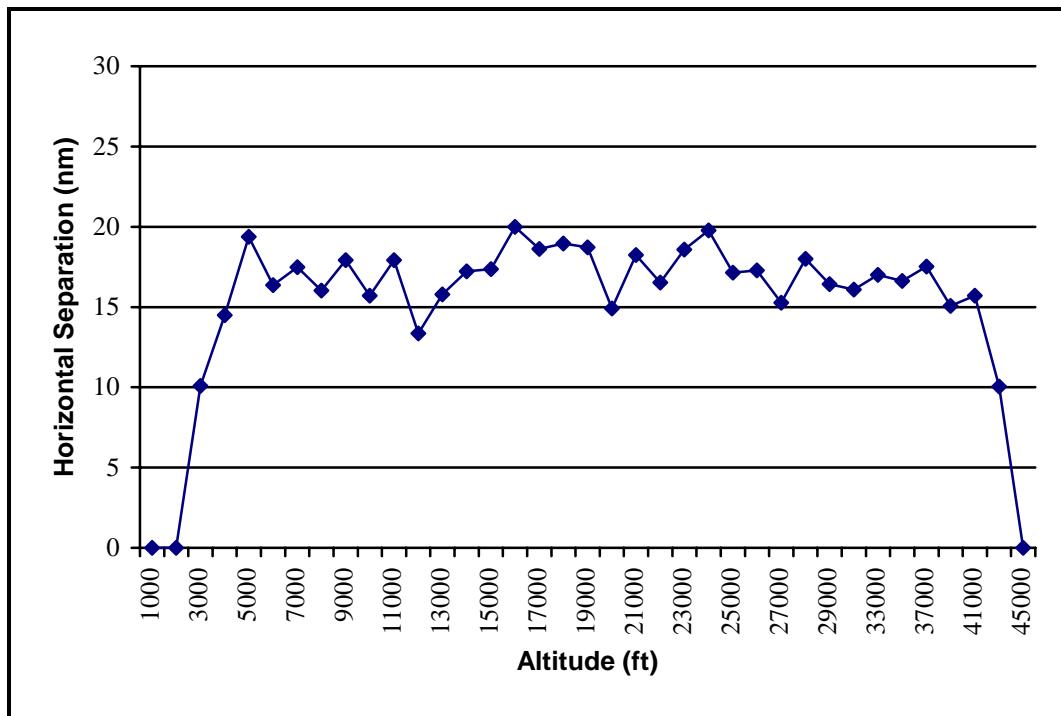


Figure 3: Average Horizontal Separation by Altitude for All Hours

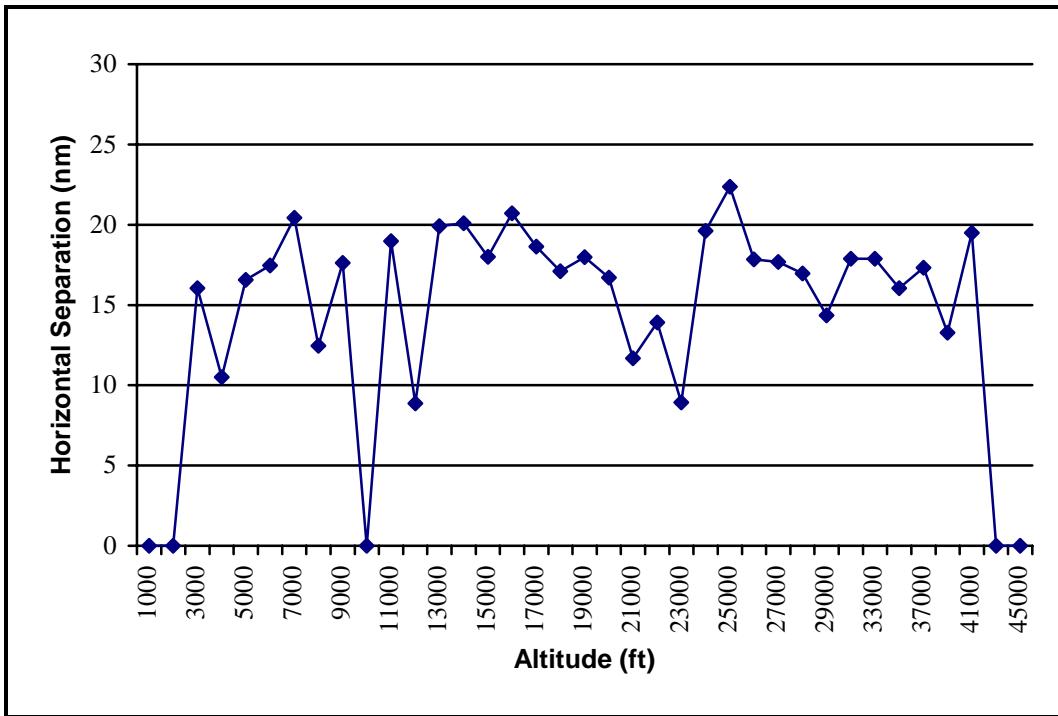


Figure 4: Average Horizontal Separation by Altitude for Hour 1

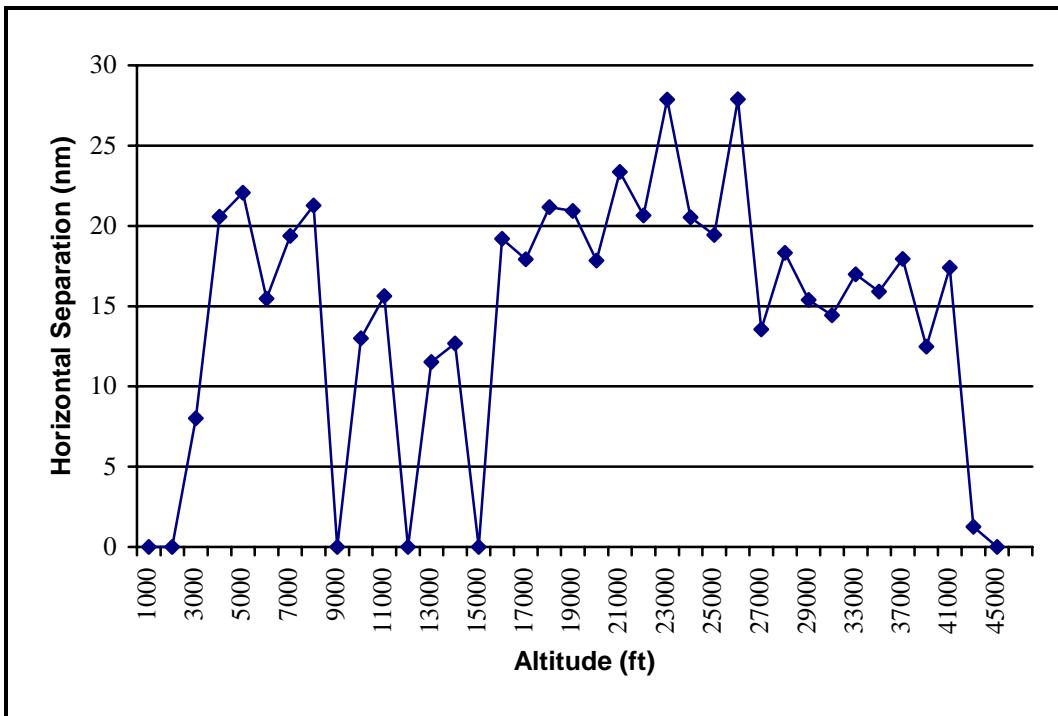


Figure 5: Average Horizontal Separation by Altitude for Hour 2

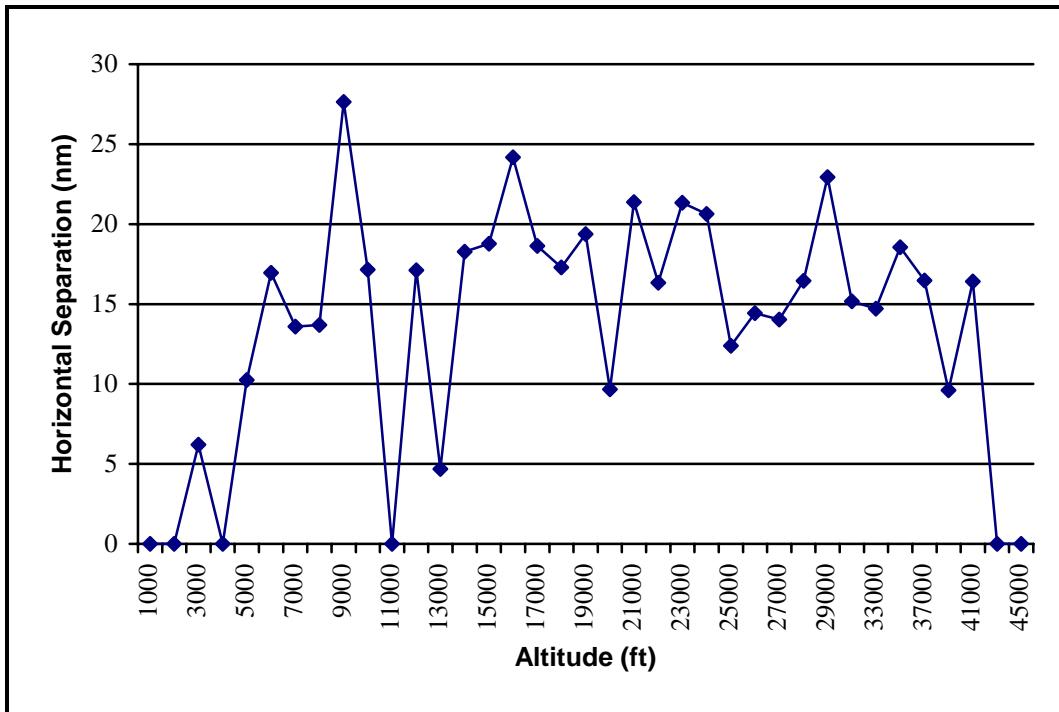


Figure 6: Average Horizontal Separation by Altitude for Hour 3

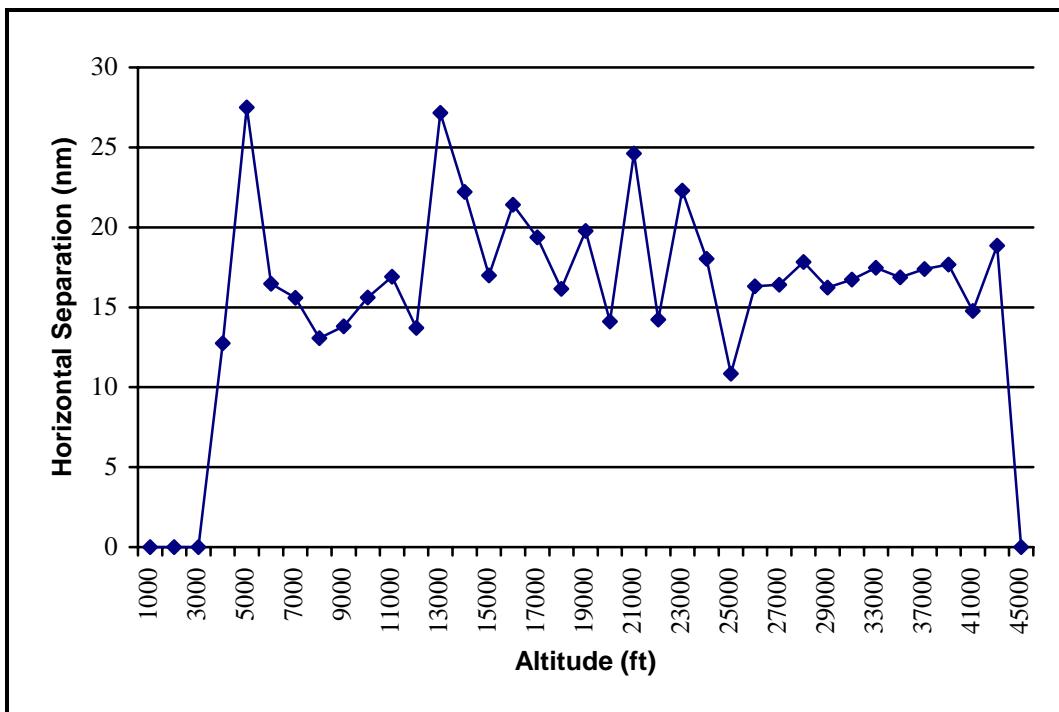


Figure 7: Average Horizontal Separation by Altitude for Hour 4

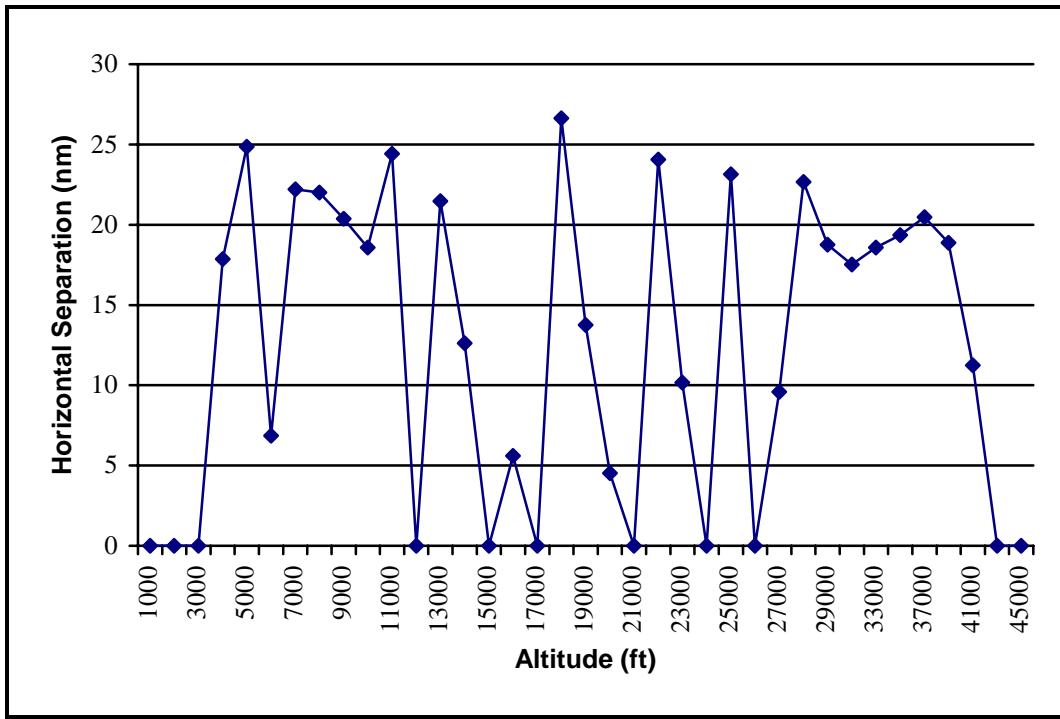


Figure 8: Average Horizontal Separation by Altitude for Hour 5

Appendix A: Supplement to Section 6.1 - Aircraft Traffic Density

Table 9: Statistics on Aircraft Encounters by Altitude Interval for All Hours

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	3	10.096	5.240
4000	10	14.489	7.764
5000	16	19.381	8.686
6000	24	16.357	7.285
7000	33	17.484	7.499
8000	9	16.021	7.656
9000	10	17.926	8.402
10000	12	15.715	5.575
11000	11	17.922	3.261
12000	8	13.346	7.329
13000	12	15.783	8.903
14000	12	17.216	7.923
15000	16	17.357	7.017
16000	23	19.989	6.808
17000	34	18.619	6.431
18000	27	18.958	7.117
19000	28	18.711	5.706
20000	28	14.909	7.866
21000	14	18.248	7.837
22000	13	16.523	7.736
23000	15	18.574	8.444
24000	18	19.777	6.472
25000	18	17.146	8.172
26000	22	17.275	8.663
27000	24	15.266	7.844
28000	59	18.008	7.552
29000	88	16.427	8.510
31000	276	16.093	8.293
33000	224	16.995	7.855
35000	204	16.630	8.300
37000	90	17.520	7.490
39000	29	15.060	8.430
41000	26	15.717	8.136
43000	2	10.053	12.438
45000	0	0.000	0.000
Total	1438		

Table 10: Statistics on Aircraft Encounters by Altitude for Hour 1

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	16.055	0.000
4000	5	10.513	8.868
5000	5	16.574	8.261
6000	8	17.464	7.335
7000	7	20.422	6.553
8000	1	12.459	0.000
9000	2	17.618	3.219
10000	0	0.000	0.000
11000	3	18.986	2.307
12000	2	8.879	6.396
13000	2	19.913	2.449
14000	2	20.091	11.789
15000	4	18.005	8.031
16000	6	20.703	6.878
17000	16	18.640	7.194
18000	3	17.105	9.263
19000	14	17.981	6.567
20000	12	16.706	8.235
21000	6	11.678	7.385
22000	4	13.913	10.996
23000	2	8.926	5.496
24000	7	19.609	8.243
25000	4	22.375	7.174
26000	10	17.832	8.509
27000	6	17.672	8.767
28000	15	16.969	7.434
29000	28	14.348	8.633
31000	81	17.883	8.656
33000	70	17.877	8.448
35000	50	16.050	8.576
37000	31	17.324	7.108
39000	5	13.284	9.613
41000	2	19.498	6.720
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	414		

Table 11: Statistics on Aircraft Encounters by Altitude for Hour 2

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	8.019	0.000
4000	3	20.575	3.430
5000	7	22.057	7.271
6000	4	15.476	2.375
7000	9	19.380	8.380
8000	2	21.261	5.282
9000	0	0.000	0.000
10000	3	12.991	6.851
11000	2	15.620	4.754
12000	0	0.000	0.000
13000	6	11.515	7.793
14000	2	12.674	3.442
15000	0	0.000	0.000
16000	7	19.204	6.203
17000	9	17.913	5.528
18000	12	21.161	6.472
19000	7	20.939	4.182
20000	4	17.832	7.547
21000	4	23.354	4.119
22000	2	20.653	3.001
23000	2	27.865	0.454
24000	4	20.525	3.710
25000	3	19.426	6.300
26000	1	27.888	0.000
27000	5	13.549	11.390
28000	24	18.313	7.865
29000	25	15.383	7.943
31000	97	14.433	8.320
33000	65	16.989	7.344
35000	76	15.900	7.790
37000	23	17.944	7.547
39000	4	12.473	9.416
41000	8	17.405	10.354
43000	1	1.258	0.000
45000	0	0.000	0.000
Total	422		

Table 12: Statistics on Aircraft Encounters by Altitude for Hour 3

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	6.213	0.000
4000	0	0.000	0.000
5000	2	10.244	13.759
6000	6	16.949	7.420
7000	6	13.592	4.721
8000	3	13.684	9.531
9000	1	27.639	0.000
10000	4	17.143	5.085
11000	0	0.000	0.000
12000	2	17.105	6.250
13000	1	4.674	0.000
14000	2	18.271	5.827
15000	1	18.770	0.000
16000	1	24.169	0.000
17000	1	18.626	0.000
18000	2	17.287	6.998
19000	2	19.378	3.156
20000	1	9.662	0.000
21000	2	21.376	2.139
22000	4	16.332	8.416
23000	4	21.331	6.161
24000	4	20.627	6.140
25000	3	12.386	8.120
26000	3	14.433	10.711
27000	3	14.020	9.358
28000	9	16.458	8.996
29000	11	22.931	6.710
31000	37	15.162	7.826
33000	40	14.704	8.112
35000	23	18.550	8.667
37000	9	16.474	6.693
39000	5	9.612	6.316
41000	5	16.413	8.443
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	198		

Table 13: Statistics on Aircraft Encounters by Altitude for Hour 4

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	1	12.751	0.000
5000	1	27.493	0.000
6000	5	16.479	10.568
7000	10	15.586	8.346
8000	2	13.075	11.049
9000	4	13.812	10.855
10000	4	15.614	6.627
11000	5	16.903	1.702
12000	4	13.700	8.705
13000	2	27.167	1.984
14000	3	22.218	9.711
15000	11	16.993	7.349
16000	8	21.416	6.592
17000	8	19.372	6.918
18000	9	16.155	7.348
19000	3	19.779	5.205
20000	9	14.105	7.041
21000	2	24.620	2.527
22000	2	14.224	2.233
23000	4	22.301	4.634
24000	3	18.036	8.231
25000	5	10.857	7.334
26000	8	16.319	8.844
27000	8	16.420	3.532
28000	6	17.833	7.228
29000	17	16.225	9.453
31000	46	16.723	7.940
33000	43	17.478	7.591
35000	44	16.863	8.557
37000	24	17.391	8.571
39000	9	17.679	9.802
41000	7	14.767	7.445
43000	1	18.848	0.000
45000	0	0.000	0.000
Total	318		

Table 14: Statistics on Aircraft Encounters by Altitude for Hour 5

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	1	17.852	0.000
5000	1	24.856	0.000
6000	1	6.861	0.000
7000	1	22.202	0.000
8000	1	22.008	0.000
9000	3	20.379	6.753
10000	1	18.578	0.000
11000	1	24.427	0.000
12000	0	0.000	0.000
13000	1	21.476	0.000
14000	3	12.622	7.703
15000	0	0.000	0.000
16000	1	5.609	0.000
17000	0	0.000	0.000
18000	1	26.637	0.000
19000	2	13.751	7.322
20000	2	4.526	5.929
21000	0	0.000	0.000
22000	1	24.062	0.000
23000	3	10.165	8.146
24000	0	0.000	0.000
25000	3	23.134	5.301
26000	0	0.000	0.000
27000	2	9.589	10.961
28000	5	22.667	3.680
29000	7	18.750	6.356
31000	15	17.531	6.669
33000	6	18.573	4.586
35000	11	19.364	8.945
37000	3	20.463	8.207
39000	6	18.875	4.153
41000	4	11.243	5.816
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	86		